Systematic error for CNI polarimeter – take II

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1. Randomized spin bit pattern
2. Effect of bunched/de-bunched beam on noise correction
3. Chisq/ndf scale factor

Randomized spin bit pattern

Basic idea is to see the distribution of physics asymmetries with forced un-polarized spin bit patterns

Procedure:

from the spin bit pattern

BLUE: 0++--++-- …

For + sign (26bunch)
2^{nd},3^{rd},6^{th},7^{th} …

For – sign (26bunch)
4^{th},5^{th},8^{th},9^{th} …

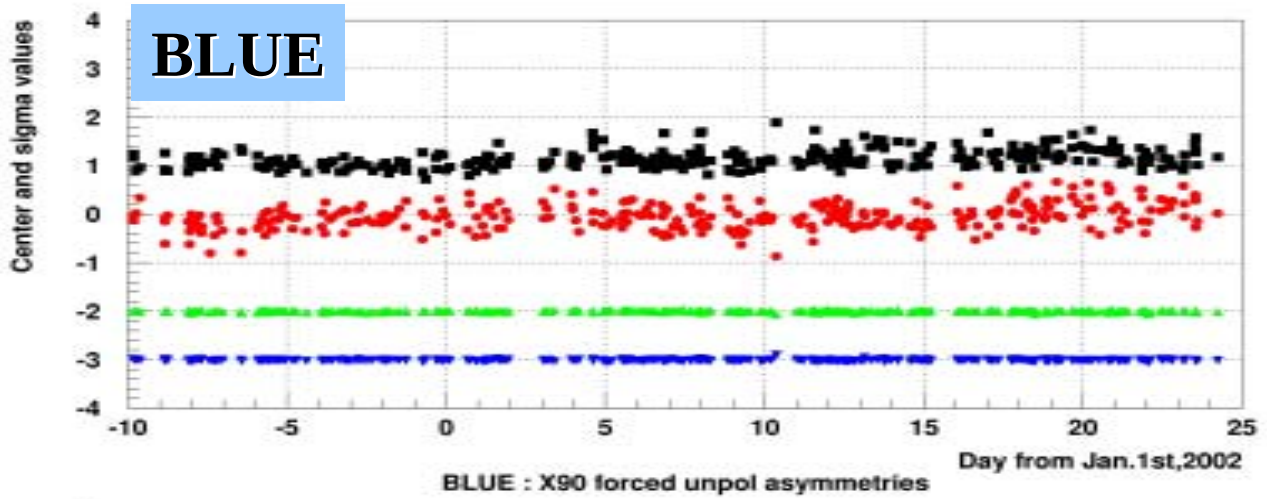
Randomly dividing into two groups, and assign the flipped spin bit for group2 and group4 to force un-polarization

Possible combinations are

$${}_{26}C_{13} * {}_{26}C_{13} = (26!/13!/13!)^2 \sim 1.1*10^{14} \text{combinations}$$

Day plots for significance value (=asymmetry/σ_{stat})

10^3 random spin patterns are applied for every run



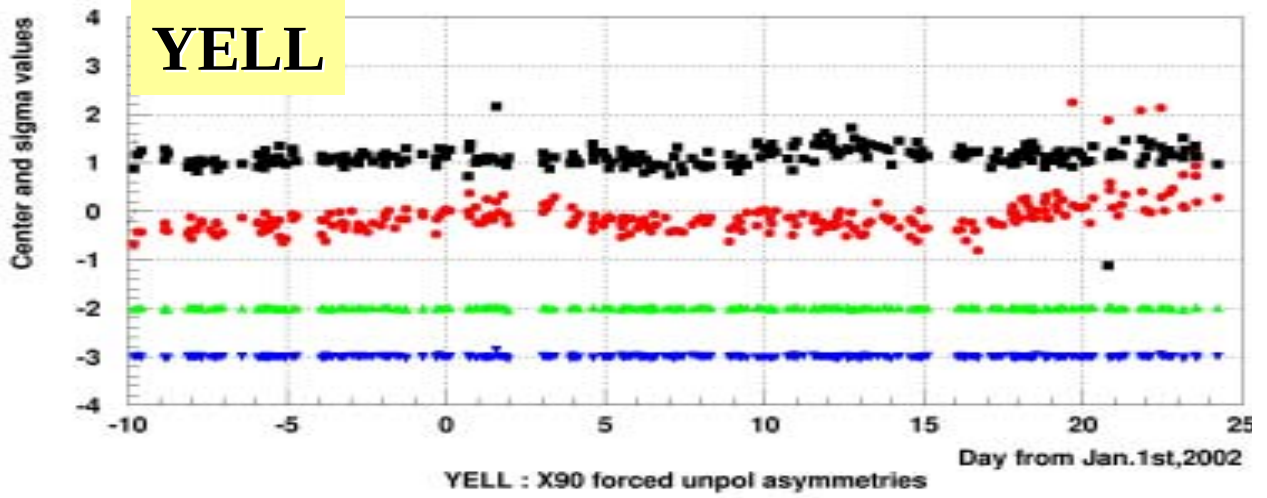
←Sigma(from fit)

←Mean(from fit)

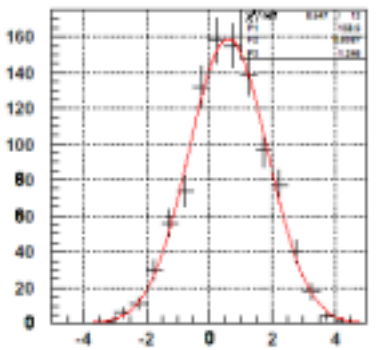
For Consistency check

←(Fit mean – Average mean) -2

←(Sigma – RMS) -3

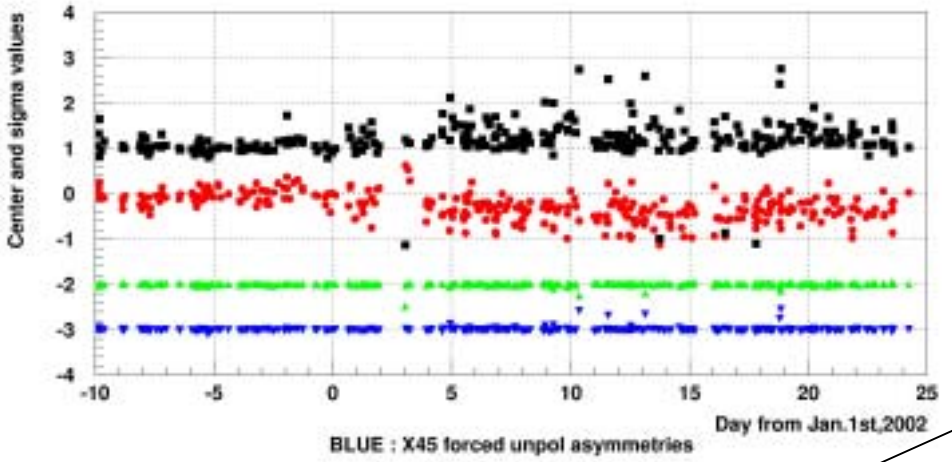


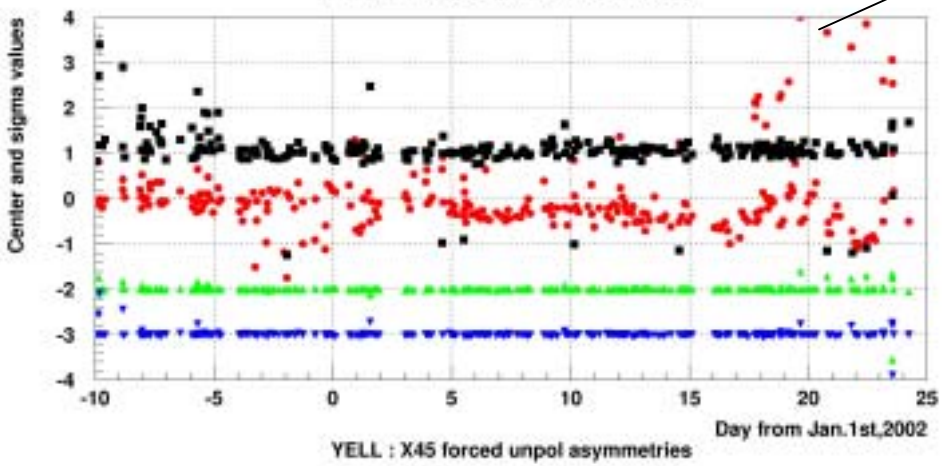
Fit sample run789



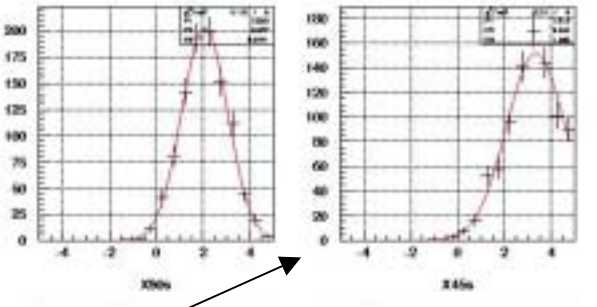
X90/sigma

Same plots for X45



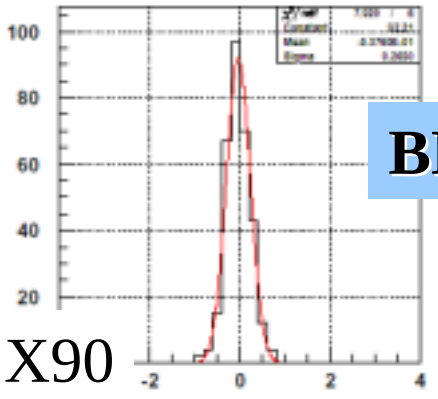


Run 873



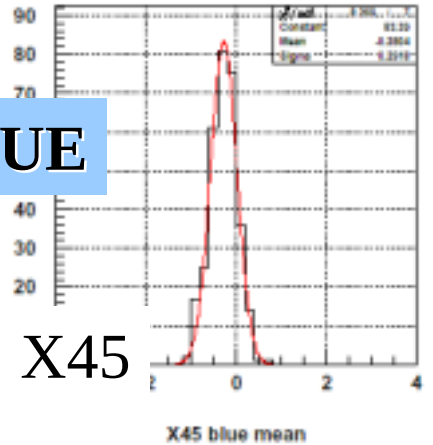
- Mean > sigma runs are found
- Large false asymmetries are expected for those runs

Projection plots



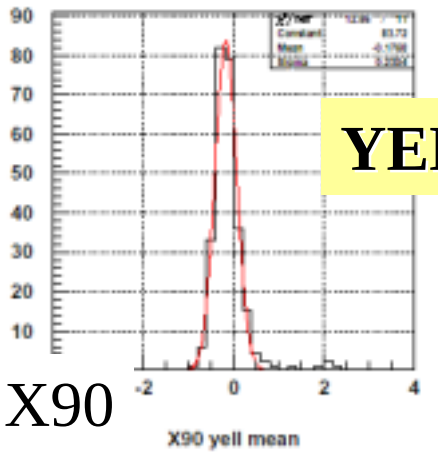
X90

BLUE



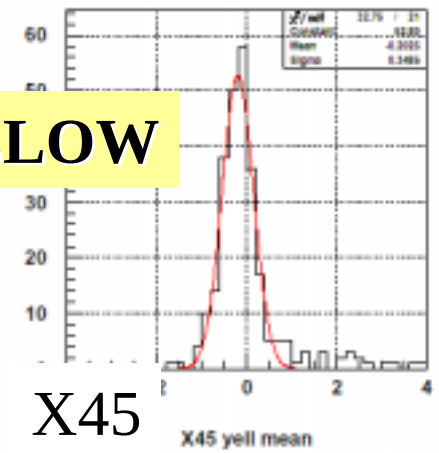
X45

Here the important value is the center of distribution



X90

YELLOW



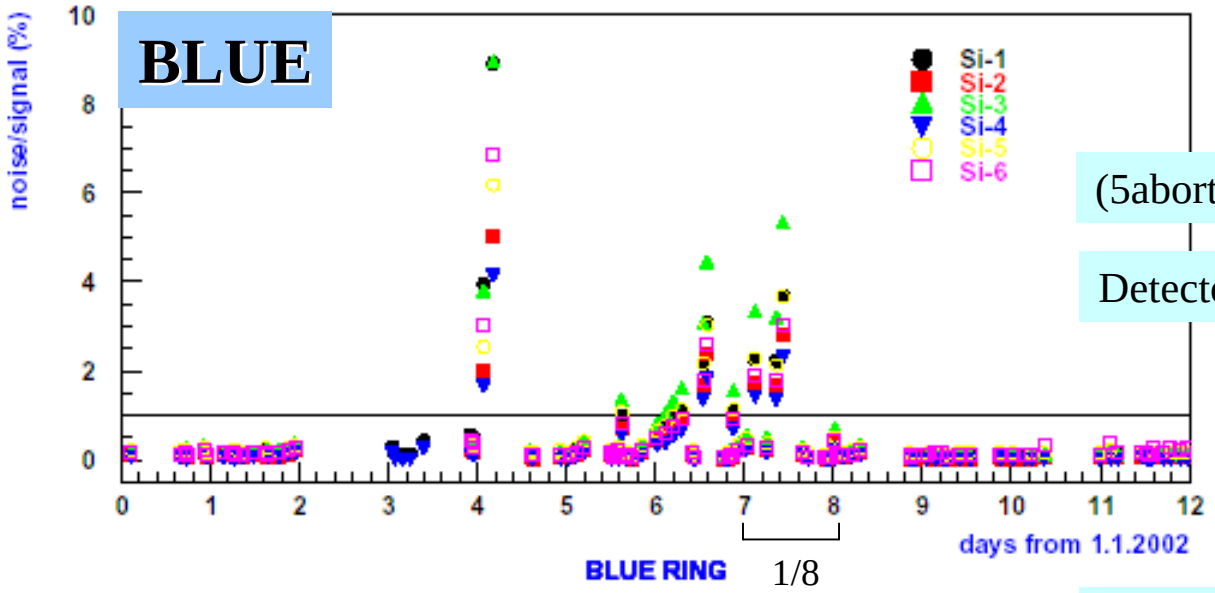
X45

BLUE
- X90 → -0.04σ
- X45 → -0.28σ

YELLOW
- X90 → -0.18σ
- X90 → -0.20σ

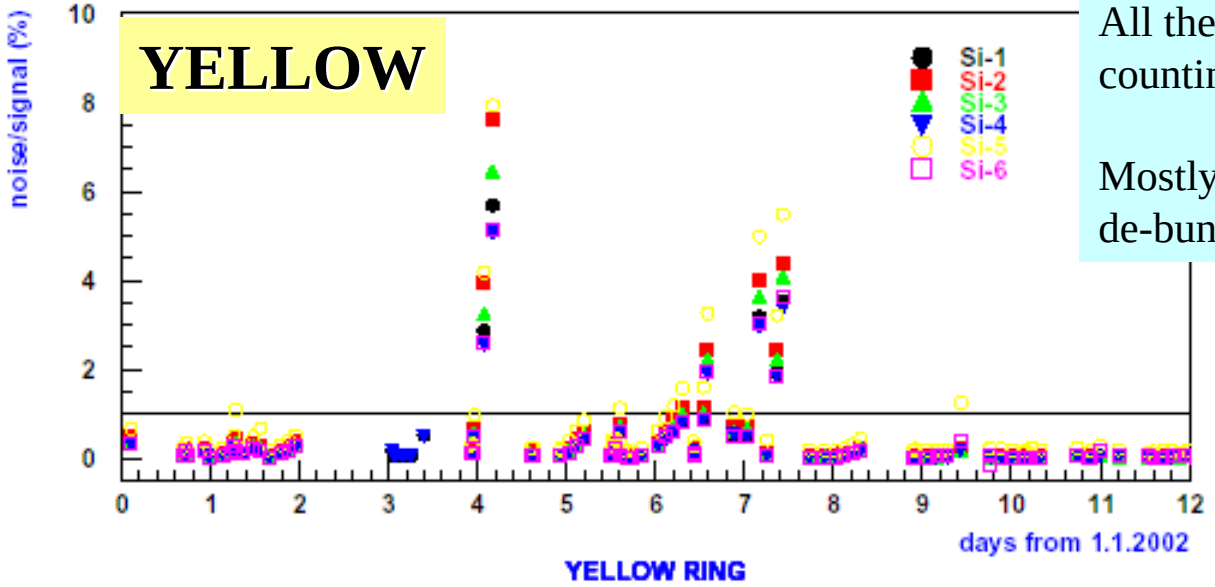
Distribution of fit mean from significance plots

De-bunched beam effect seen by CNI



(5abort/55normal)*55/5*100

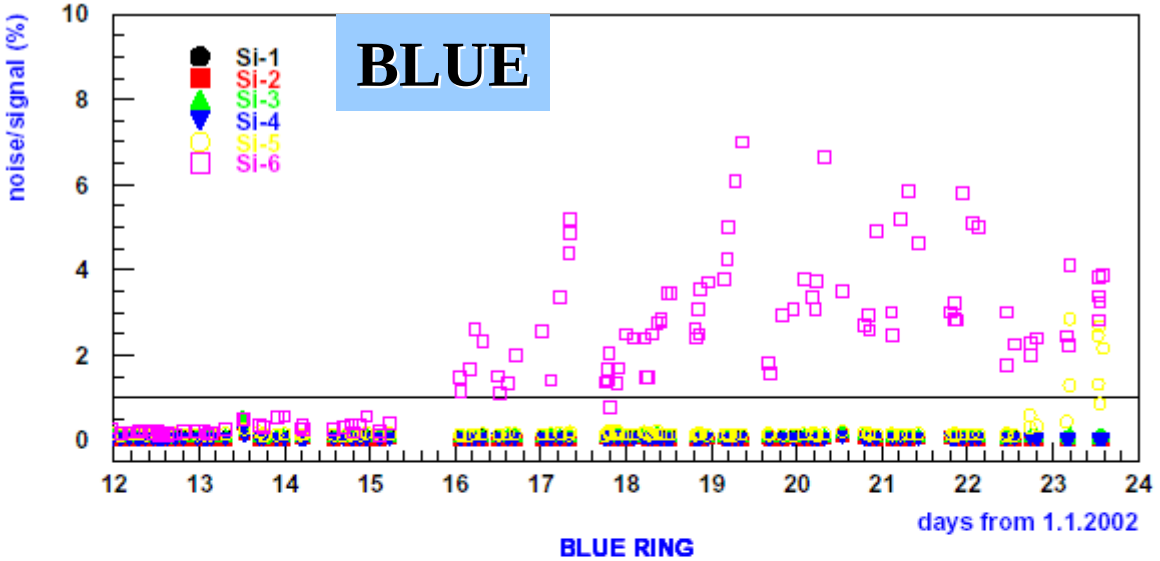
Detector average values are plotted

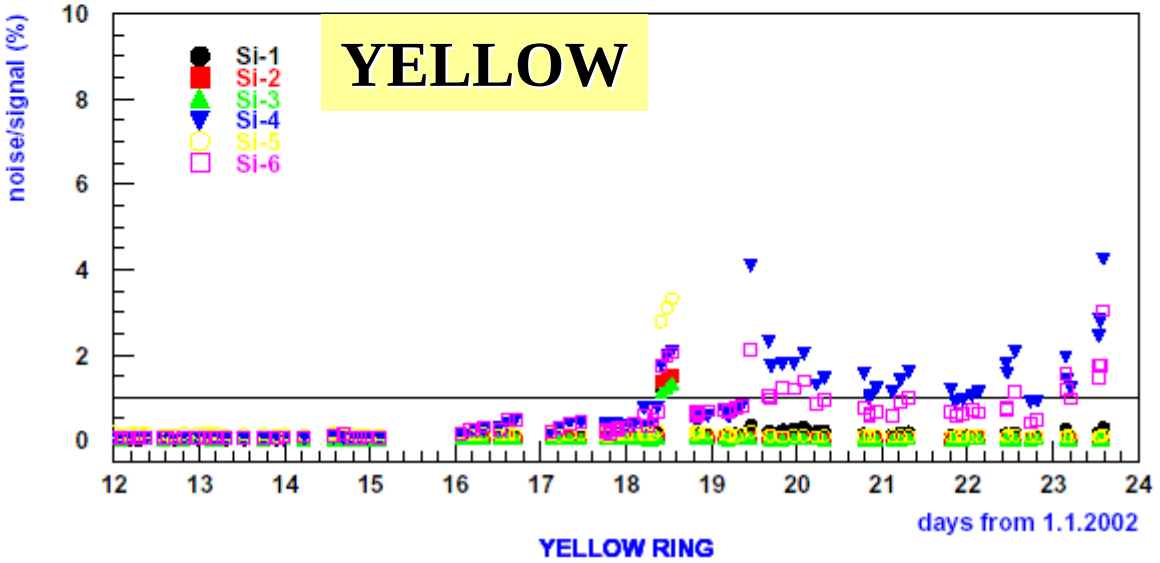


All the detectors (strips) are counting the signal at abort gap

Mostly corresponding to STAR de-bunched beam monitor DB

Strip specific noise effect seen by CNI

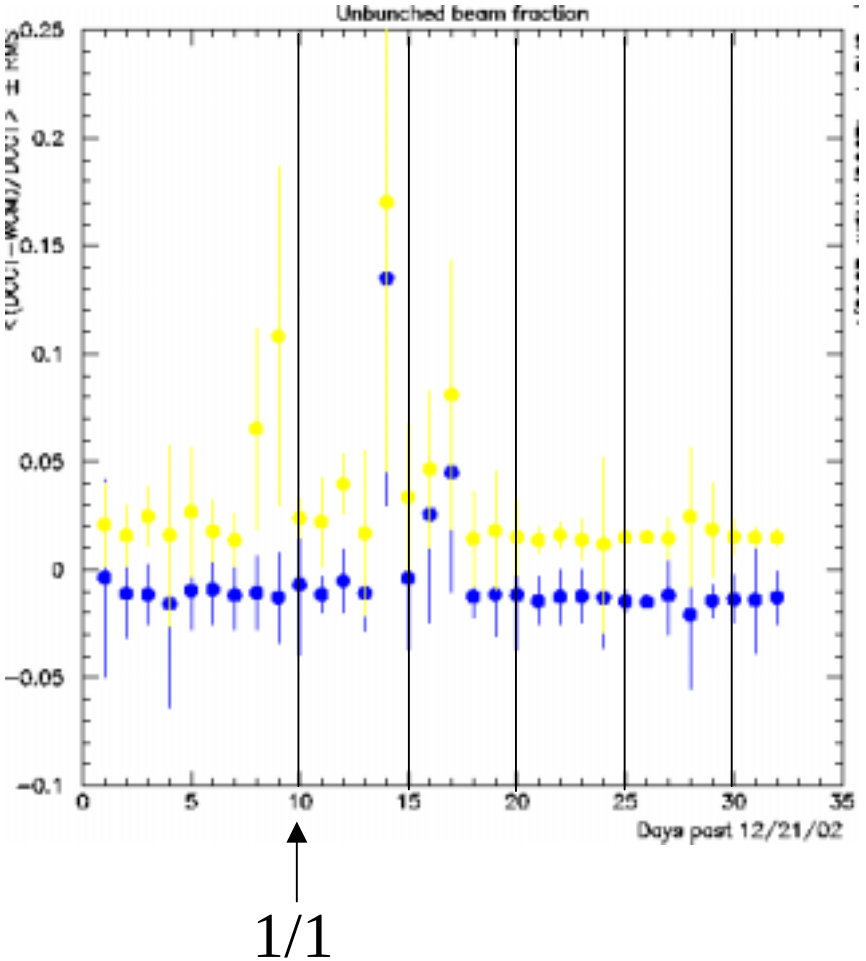




Some strips became largely noisy while the other rest remain silent → can be attributed the noise

- The un-bunched component and the noise effects are clearly separated
- Special care must be taken for un

Un-bunched Beam Fraction by L.Bland



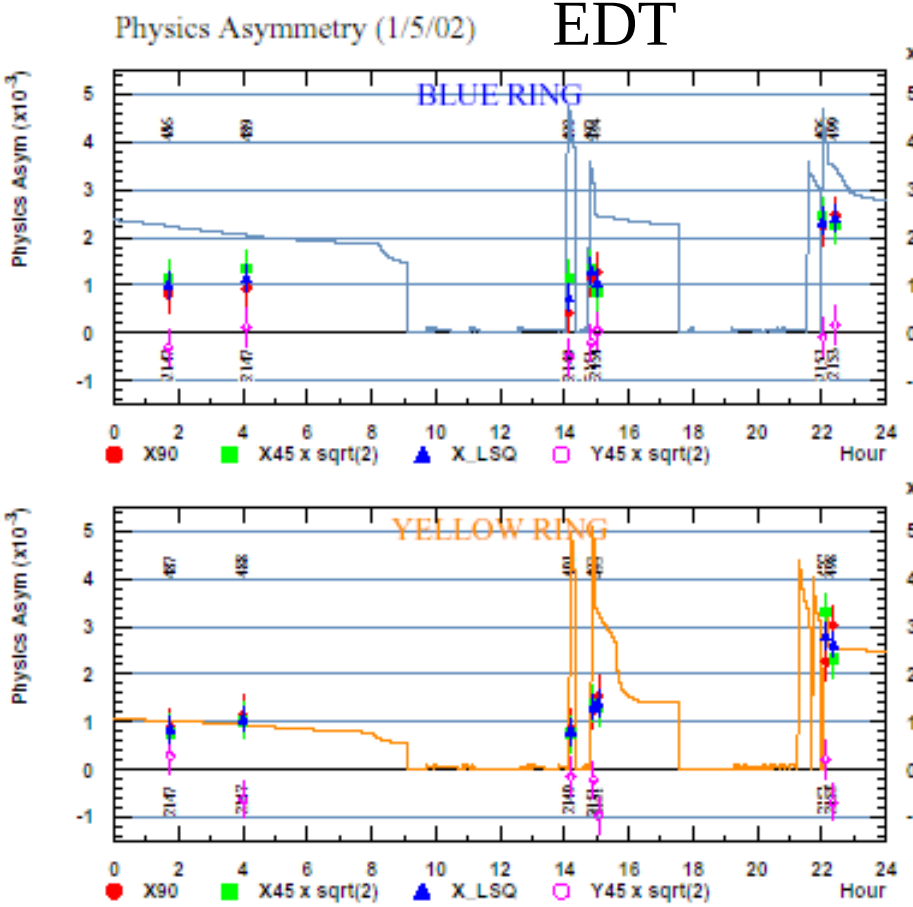
The un-bunched beam fraction from RHIC run 2 is determined for the period from 12/22/01 to 1/23/02. Values for the total bunched+un-bunched beam ions were obtained from the DC current transformer (DCCT). Values for the number of bunched ions were obtained from the wall current monitor (WCM). Separate values for the Blue and Yellow ring were recorded into the STAR database every minute during the run, and were retrieved for this analysis.

The average of the relative deviation of the DCCT from the WCM was determined day-by-day, and is plotted below.

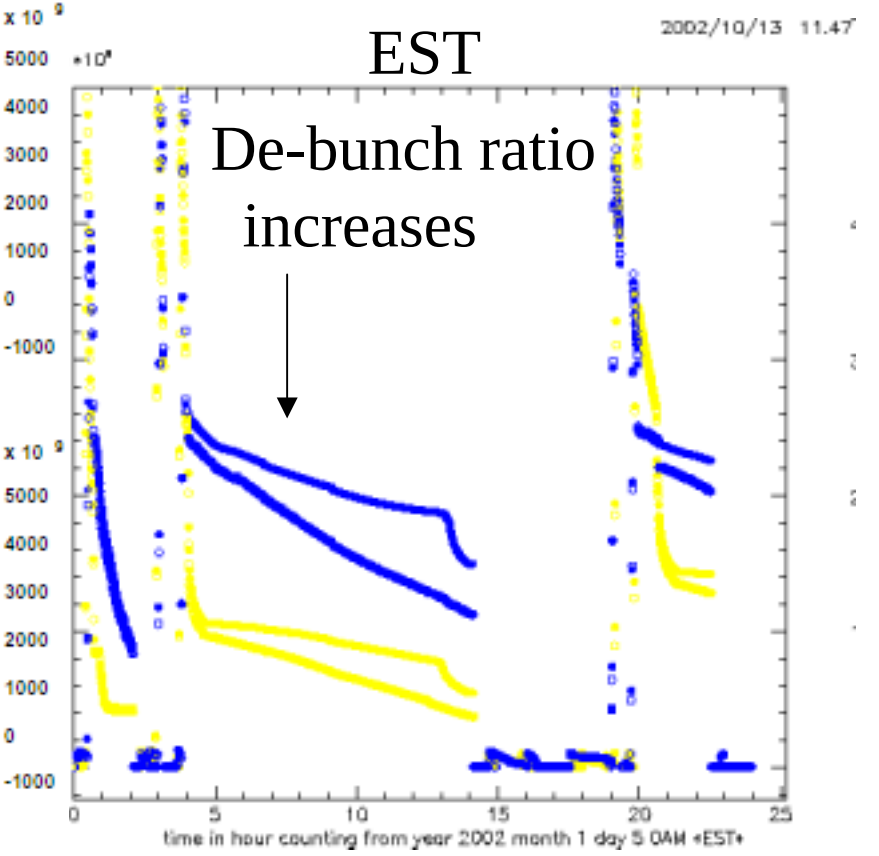
Most of the data are scattered about values reflecting offsets in the calibrations of the two devices. Significant deviations are seen in the **Yellow ring on 12/30, 12/31, 1/5, 1/6, 1/7, 1/8** and in the **Blue ring on 1/5, 1/7 and 1/8**. There may be increased background in the corresponding CNI polarimeter on those days.

1/5/02 comparison

EDT

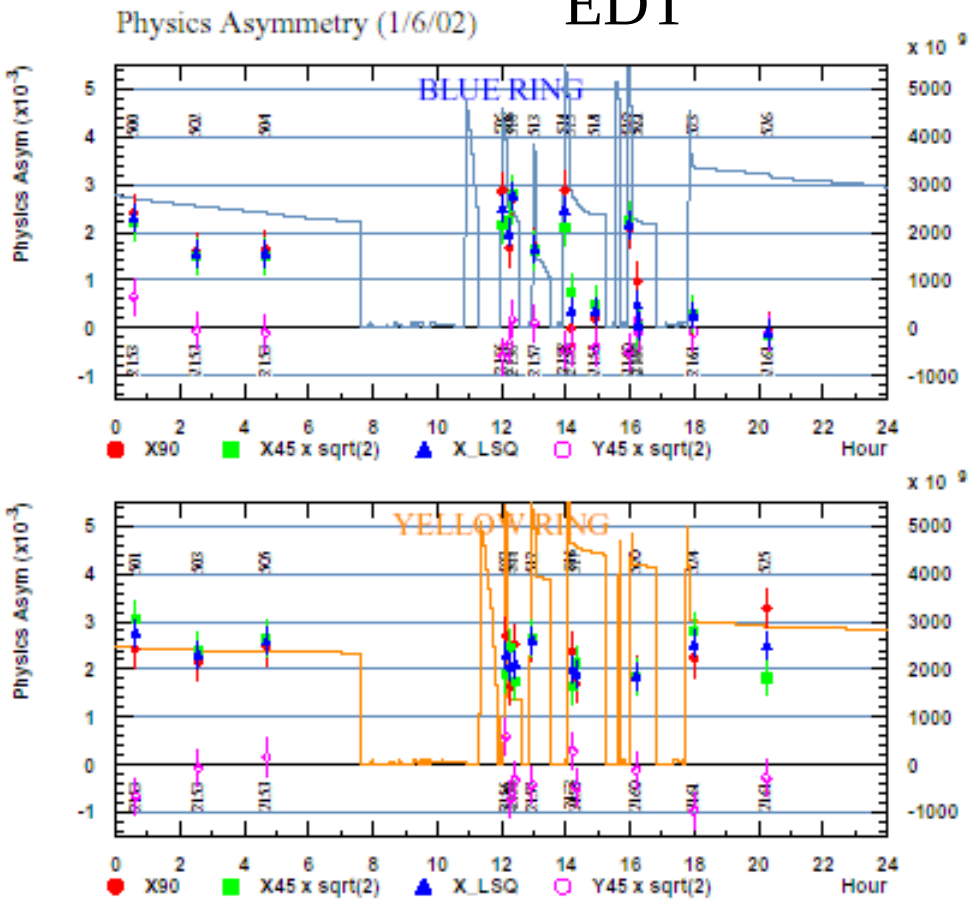


EST

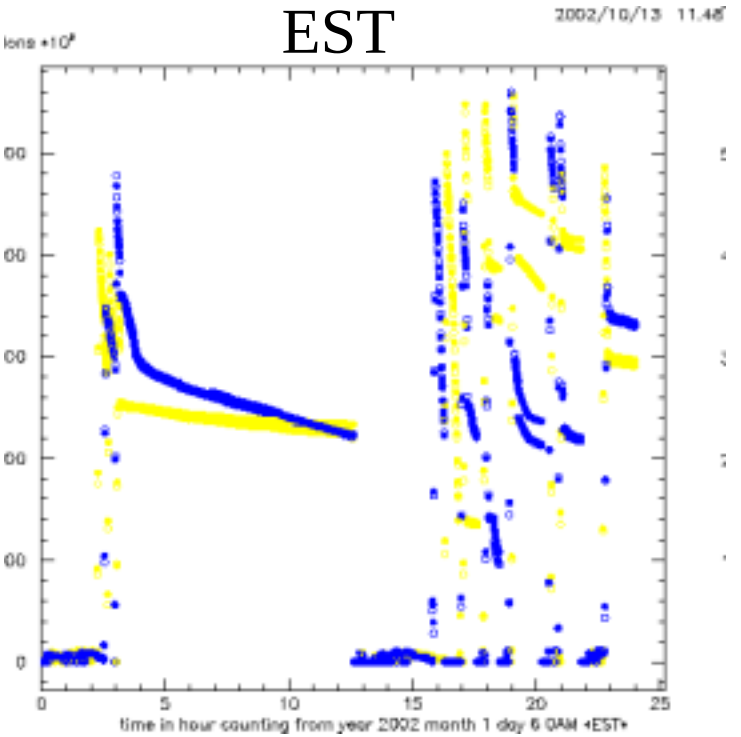


1/6/02 comparison

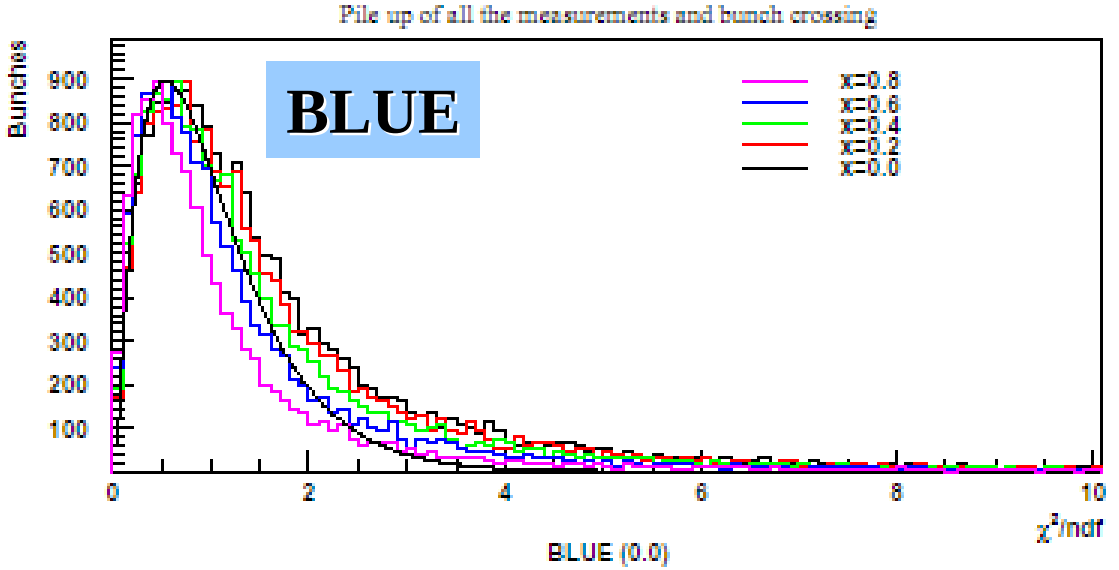
EDT

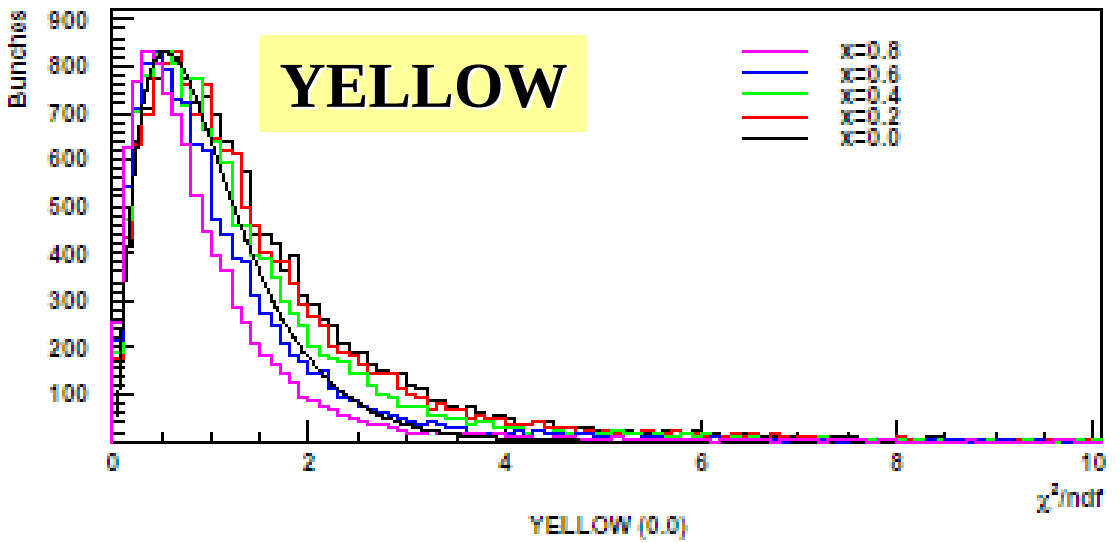


EST



Scaled χ^2/ndf distributions





$$\chi^2 = \sum_{\text{detector}} \left(\frac{(x_i - \bar{x}_i)^2}{\sigma_{stat}^2 + \sigma_{sys}^2} \right)$$

$$= \frac{1}{(1+f^2)} \sum_{\text{detector}} \left(\frac{(x_i - \bar{x}_i)^2}{\sigma_{stat}^2} \right)$$

"f" looks to be between 0.4 and 0.6

• Distributions are normalized with the maximum contents

Scaled χ^2/ndf distributions (in log scale)